# DR. KARL JORDAN'S EXPEDITION TO SOUTH-WEST AFRICA AND ANGOLA: SIPHONAPTERA.

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(With 8 text-figures.)

THE mammals obtained on the Expedition were mainly collected for the sake of their Ectoparasites, particularly fleas. As I found little time for trapping, especially in Angola, we did not get large numbers of fleas, there being hardly ever anything on the mammals brought in dead or alive by the natives. Since my return to Europe, Herr W. Hoesch, one of my companions in South-West, has sent me from that country two consignments of fleas which add materially to the collection. Some of the species we obtained are new, the most interesting new flea being a subspecies combining characters of *Ctenocephalides felis felis* and *Ct. connatus*.

In order to make the report on the fleas more useful, I have included in it all the species known to me from South-West and Angola.

## I. SOUTH-WEST AFRICA.

### 1. **Echidnophaga gallinaceus** Westw. 1875.

*Sarcopsyllus gallinaceus* Westwood, *Ent. Mo. Mag.*, xi, p. 246 (1875) (Ceylon).

Abundant in the warm districts of the Eastern Hemisphere and in the Southern States of U.S.A. We have no records of it from Central and South America. A pest on fowl and other birds, but also common on mammals.

Maltahöhe, xii., on *Aethomys namaquensis namaquensis*.——Hoffnung, x., xi. 1933, on *Geosciurus capensis* and *Cynictis penicillata bradfieldi*.——Omongongua, N.W. of Okahandja, iv. 1934, on *Mungos mungo*.——Otjosongombe, Waterberg, xi. 1933, and Ombijomatemba, near Otjivarongo, on *Cynictis penicillata*, *Geosciurus capensis* and *Lepus capensis*.——Otavifontein, xi. 1933, on *Aethomys namaquensis namaquensis*.

### 2. **Echidnophaga larina**, J. & R. 1906.

*Echidnophaga larina* Jordan & Rothschild, *Thomps. Yates & Johnst. Lab. Rep.*, vii, i, p. 49, no. 3, pl. 1, fig. 12; pl. 2, fig. 18; pl. 3, fig. 25 (1906) (So. Afr., Abyss., Somalild.).

The species was only known from the eastern side of the continent. Its true host appears to be the Aardvark (*Orycteropus*), but the flea is also found on Carnivora (which prey on the Aardvark or make use of its burrows).

Otjosongombe, xi. 1933, on *Hyaena brunnea*, a small series, the proboscis embedded in the skin of the host.

### 3. **Echidnophaga aethiops** J. & R. 1906.

*Echidnophaga aethiops* Jordan & Rothschild, *Thomps. Yates & Johnst. Lab. Rep.*, vii, i, p. 51, no. 4 (1906) (Namaqua).

Spitzkopje, on "*Nycteris grandis*," vii. 1912 (O. Püschel), 1 ♀.——Klipfontein, on *Nycteris capensis*, vi. 1903 (Capt. C. H. B. Grant), 1 ♀.——Occurs also on the east side of the continent.

4. **Procaviopsylla angolensis** Jord. 1925 (text-fig. 34).

*Procaviopsylla angolensis* Jordan, *Nov. Zool.*, xxxii, p. 102, no. 15, text-figs. 12–14 (1925) (Bengnela)

Naukluft Mts. 1,300–1,500 m., xii.1933, on *Procavia capensis windhuki*, 2 ♂♂, 3 ♀♀. The specimens agree very well with the Angolan ones, except that in these ♀♀ the head of the spermatheca is slightly larger and that there are fewer bristles on abdominal segment VII, 8 or 9 instead of 13. As we have only one Angolan ♀, the range of variability in that country is not known.

5. **Xenopsylla erilli** Roths. 1904.

*Pulex erilli* Rothschild, *Nov. Zool.*, xi, p. 610, no. 5, pl. 8, figs. 16, 17; pl. 9, fig. 22 (1922) (Deelfontein, Cape Prov.).

Omongongua, iv.1934, on *Crossarchus fasciatus*, 1 ♀.—A flea of the Ground Squirrel, but frequently found on Carnivora.

6. **Xenopsylla brasiliensis** Baker 1904.

*Pulex brasiliensis* Baker, *Proc. U.S. Nat. Mus.*, xxvii, pp. 378, 379 (1904) (S. Paulo).

Okahandja and Waterberg, iii.–iv.1934, on *Thallomys damarensis*, a series. ——Omongongua, on *Procavia*, one ♂.——Otavifontein, xi.1933, on *Aethomys namaquensis namaquensis*, *Mastomys coucha* and (1 ♀) *Crocidura hirta*, a series.—— Ombijomatemba, on *Aethomys chrysophilus imago*, 1 ♀.

7. **Xenopsylla scopulifer** Roths. 1905.

*Pulex scopulifer* Rothschild, *Nov. Zool.*, xii, p. 480, no. 2, pl. 13, fig. 5 (1905) (Zululand).

Ombijomatemba, on *Aethomys chrysophilus imago*, 1 ♀.——The species was hitherto known only from Zululand and Portuguese East Africa.

8. **Xenopsylla nubicus** Roths. 1903.

*Pulex nubicus* Rothschild, *Ent. Mo. Mag.* (2), xiv, p. 82, no. 2, pl. 2, figs. 10, 16 (1903) (Shendi).

Ombijomatemba, on *Aethomys chrysophilus imago*, 1 ♀.——The first record from a locality so far south, Nyasaland being the most southern country from which we have specimens of this species.

9. **Xenopsylla eridos** Roths. 1904 (text-fig. 35).

*Pulex eridos* Rothschild, *Nov. Zool.*, xi, p. 611, no. 6, pl. 8, fig. 21; pl. 9, fig. 23 (1904) (Deelfontein).

Ombijomatemba, on *Aethomys chrysophilus imago*.——Otjosongombe, ix.1933, on *Mastomys coucha bradfieldi* and *Cryptomys damarensis lugardi*, a series.

In the N. C. Rothschild collection only from various places in Cape Province. The record from Zululand in *Verh. III. Intern. Ent.-Kongress*, p. 616 (1926) is erroneous; the specimen belongs to the next species.

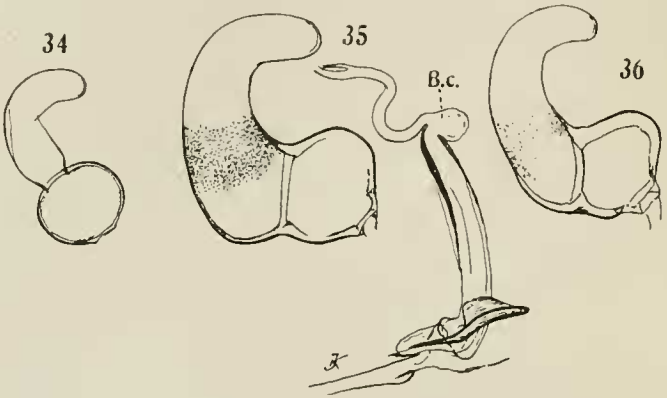
10. **Xenopsylla piriei** Ingram 1928 (text-fig. 36).

*Xenopsylla piriei* Ingram, *Bull. Ent. Res.*, 18, p. 371, text-figs. 1, 2 (1928) (Transvaal; Cape Prov.).

Hoffnung, x.1933, on *Desmodillus auricularis*, a small series.

The ♂♂ of this species and *X. eridos* are easily distinguished from one another by the difference in the tendons of the penis; in *X. eridos* the tendons make only half a convolution, whilst in *X. piriei* they make one and a half convolutions, as pointed out by Dr. Ingram. In the ♀♀ there is no such conspicuous

difference, but the specimens of the two species from South-West can be separated by the spermatheca, the duct of the bursa copulatrix and the sclerite at the base of this duct. As illustrated by text-figs. 35 and 36, taken from South-Western




specimens, the base of the tail of the spermatheca is somewhat broader in *X. eridos* than in *X. piriei*. Moreover, the duct of the bursa copulatrix is shorter in *X. eridos* and the sclerite placed at its base also slightly shorter. However, these distinctions are less precise in the long series of ♀♀ we have from South Africa.

### 11. **Ctenocephalides connatus** Jord. 1925.

*Ctenocephalus connatus* Jordan, *Nov. Zool.*, xxxii, p. 98, no. 6, text-fig. 5 (1925) (So. Afr.; Tang. Terr.).

Ombijomatemba, on *Geosciurus capensis*, a series.

Like the preceding species, *Ct. connatus* was only known from the eastern side of the continent. In all the South-Western specimens of both sexes the head is very strongly rounded, contrasting very much in shape with the head of the subspecies of *Ct. felis* here following.

### 12. **Ctenocephalides felis damarensis** subsp. nov.

♂♀. Frons as strongly slanting forward and its oral angle as sharp as in *Ct. felis felis* Bouché 1935. In ♂ foretarsal segment V with 5 or 6 stout short ventral bristles at and near apex as in *Ct. connatus* ♂. In ♀ abdominal sternites III to VI with 2 bristles each side, VII with 2 or 3. Frons in some ♂♂ slightly shorter than in others.

Omongongua, near Okahandja, iii. 1934, on *Procavia capensis windhuki*.——Otjosongombe, xi. 1933, on *Myonax cauii bradfieldi*.——Waterberg, v. 1934, on *Lepus crassicaudatus* and *Ictonyx striata*.——Ombijomatemba, near Otjivarongo, on *Cynictis penicillata* and *Lepus capensis*.——Gobabis, on *Genetta felina pulchra*.

Evidently common. Nearly all the specimens were received from Herr W. Hoesch, who remarks on the abundance of this flea on the veranda of his house at Omongongua. He says that the flea probably was brought in by the dog and was breeding so profusely that one's legs got covered with fleas in crossing the veranda.

The specimens look so much like European cat-fleas that I determined them as such before any had been cleared and mounted. The introduced European

cat which one finds on the farms, sometimes in numbers, would have explained the occurrence of the European cat-flea. The ♀♀ of *Ct. felis damarensis* do not present any differences from that sex of *Ct. felis felis* and from extreme narrow-headed *Ct. felis strongylus* Jord. 1925; whilst all the ♂♂, some 70, possess on protarsal segment V a cluster of spiniforms at apex as in *Ct. connatus*. In both sexes the proboscis is as short as in *Ct. felis felis*, i.e. shorter than in *Ct. connatus*. As *Ct. connatus* occurs in South-West, whereas *Ct. felis strongylus* was not obtained, we conclude that the flea in question is the South-West African representative of *Ct. felis*.

The presence of ventral spiniforms on the end-segment of the foretarsus of the ♂ is of some interest. The fifth segment generally bears in fleas some minute hairs on the ventral surface, in many cases from near the base to the apex, and occasionally these hairs develop into short spiniforms, as for instance in *Dasypsyllus lasius* Roths. 1909, from Argentina. One, two or three apical ones are always a little enlarged, one being usually longish and more like a stiff hair, and the others shorter and spiniform. In *Ct. f. damarensis* ♂ segment V of mid- and hindtarsus bears 2 such spiniforms, very occasionally 3 in one tarsus, whilst in the foretarsus, in addition to these, 3 or 4 others have become spiniform. If there are only 5 spiniforms on the foretarsus, there is in front of the cluster one small hair larger than the small hairs, and it is this hair which has developed in other specimens into a slender and short spiniform. It is, further, interesting to note that the cluster of spiniforms of *Ct. connatus* and *Ct. f. damarensis* occurs again in *Ct. arabicus* Jord. 1925, from Arabia, but not in the species of *Ctenocephalides* found only in Kenya, nor in any of the related genera. There must be some reason for the acquisition of the cluster of spiniforms—it can hardly be retention—in the two widely separated districts. The cause of the development of the cluster may lie concealed in the similarity of environment in these dry countries. I do not wish to imply, however, that a dry climate directly produces spines in animals as it produces thorns and spines in plants. The cluster is confined to the ♂, and ♂-characters mostly have the function of bringing the sexes together or facilitating mating. We may, therefore, conclude that the cluster comes into play when the ♂ is underneath the ♀; but I cannot guess at its special function.

A further point of interest is the difference in the shape of the head obtaining in the various species and subspecies of *Ctenocephalides*. The short head with the strongly rounded frons may be taken as ancestral, from which the long-fronted head of *Ct. felis* is derived. The 4 geographical races of *Ct. felis* show all the gradations from a strongly rounded primitive frons to a strongly elongated younger frons:

(*a*) In Tropical Africa, *Ct. felis strongylus*, the frons varies from being as round and short as in *Ct. connatus* to being nearly as long and pointed as in *Ct. felis felis*.

(*b*) In South-West Africa, *Ct. felis damarensis*, the frons is strongly pointed, sometimes in the ♂ with a very slight inclination towards round-headedness.

(*c*) In the Nile countries and the Palaearctic Region, *Ct. felis felis*, the frons is always long and pointed.

(*d*) In the Oriental Region, *Ct. felis orientis* Jord. 1925, the frons is nearly as much rounded as in *Ct. canis* Curtis 1926.

13. **Listropsylla prominens** Jord. 1930.

*Listropsylla prominens* Jordan, *Nov. Zool.*, xxxvi, p. 133, no. 4, text-figs. 3, 4 (1930) (Zululand).

Gobabis, on *Aethomys chrysophilus*, x. 1925 (Dr. Ingram), 1 ♀.——The genus is known from South and East Africa, Uganda and the Ruwenzori. Gobabis is so far the most western locality of its range.

**Oxyparius** gen. nov.

Similar to *Ischnopsyllus* Westw. 1840 and *Araeopsylla* Jord. & Roths. 1921, differing from both in the following combination of characters:

The dorsal incrassations so conspicuous in *Araeopsylla* on the thoracic and abdominal tergites absent or at most feebly indicated. Bristles of the *Ischnopsyllus*-type, not spiniform as many are in *Araeopsylla*. Genal process as strongly chitinized as in *Araeopsylla*, but gradually narrowed to a point, its upper margin straight or nearly and the tip sharp. Metepimerum not extending so far dorsad as in *Araeopsylla*, the abdominal tergite I being broader than in that genus, agreeing with *Ischnopsyllus* in width. Basal abdominal sternite with one or more lateral bristles anteriorly above middle, such bristles not occurring in any other bat-flea (apart from very minute hairs at the extreme basal margin). Segment V of all tarsi with four lateral pairs of plantar bristles and one ventral pair, the latter placed nearly in between the second pair, which is unusual.—— Genotype: a species here identified as *Ischnopsyllus isomalus* Waterst. 1915.

14. **Oxyparius isomalus** Waterst. 1915 (text-fig. 37).

*Ischnopsyllus isomalus* Waterston, *Rec. Albany Mus.*, III, 2, p. 109, text-figs. 4, 5 (1915) (Pretoria, possibly off *Miniopterus*, one ♀).

*Araeopsylla isomalus Waterst.*, Jord. & Roths., *Ectoparasites*, I, p. 146 (1921).

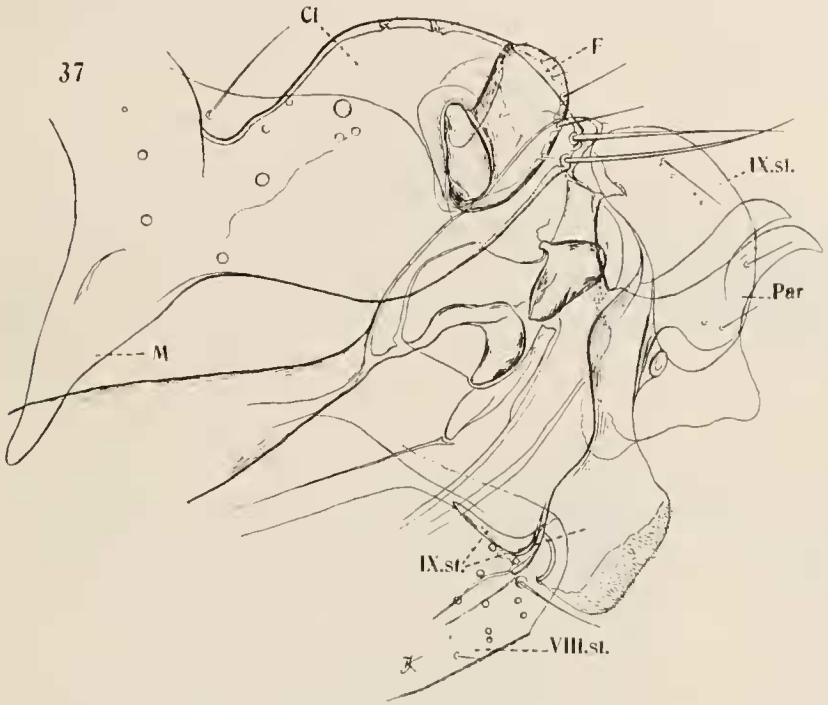
Klein Windhoek, x. 1933, on *Miniopteris natalensis smitianus*, 1 ♂.

Described from a single Pretoria ♀ in the Albany Museum at Grahamstown. We have a ♂ from the same cave where the ♀ was obtained, the bat being determined as *Miniopteris natalensis*. The ♂ from South-West agrees with the Pretoria ♂ apart from some differences in details, which I consider to be distinctions obtaining between individuals. Both ♂♂ evidently belong to the same species as the ♀ described by Waterston, although they do not quite agree with the description. Waterston says of tarsal segment V that it bears 4 stout marginal bristles, the first two longer than the second pair, 1 stout ventral bristle and 7–8 dorsal. According to this description the ventral pair of our 2 ♂♂ is represented in the ♀ by a single bristle.

Spines in the combs of the South-West ♂: 23, 19, 15, 17, 12, 8.

Modified Segments.—Tergite VIII large, rounded posteriorly, with 9 or 10 bristles on upper half of side, the largest of them close to margin; sternite VIII triangular (in lateral aspect), with the apex rounded and membranous, before apex 11 or 12 slender bristles. Clasper irregularly elliptical, dorsally somewhat more strongly rounded than ventrally, at apex 2 long bristles, above them the margin of clasper straight and oblique to angle of F, where there is a minute marginal projection and a minute hair; manubrium M very strongly oblique, the bay between it and tergite IX being very shallow. Sclerite F twice as long as broad in middle, ventrally and apically strongly rounded, anterior (=dorsal) margin straight, angle formed with apical margin distinct but obtuse, 2 slender

subapical bristles above middle of posterior side (=ventral), about as long as F is broad, and a few minute bristles. Vertical arm of IX st. a short and narrow process; ventral arm in three sections: basal section subrectangular, about one-fourth longer than broad, ventrally covered with minute hairs; middle section




much narrower, ventrally about as long as proximal section; apical section elongate reniform, incurved on proximal side and evenly rounded on posterior side, bearing a few slender bristles, some of them in a row in upper half and 2 each side submarginal in lower half; the apical section measured vertically about half the length of the total ventral arm. Apical armature of penis with a long hook each side (Par.).

## II. ANGOLA.

### 1. **Tunga penetrans** L. 1758.

*Pulex penetrans* Linnaeus, *Syst. Nat.*, ed. X, p. 614, no. 2 (1758).

Common at the coast as well as in the interior.

### 2. **Echidnophaga gallinaceus** Westw. 1875.

Cf. *antea*, p. 82.

Nova Lisboa (= Huambo), i.1926, on a hawk (H. F. Varian), 1 ♂, 1 ♀.

### 3. **Pariodontis riggenbachi** Roths. 1904.

*Pulex riggenbachi* Rothschild, *Nov. Zool.*, xi, p. 611, no. 7, pl. 8, figs. 19, 20; pl. 9, fig. 24 (1904) (Morocco and Cape Province, type Deelfontein, C.P.).

Mongona R., Bihé, xii.1904, on *Hystrix* (Dr. W. J. Ansorge), a small series.

### 4. **Procaviopsylla angolensis** Jord. 1925.

Cf. *antea*, p. 83.

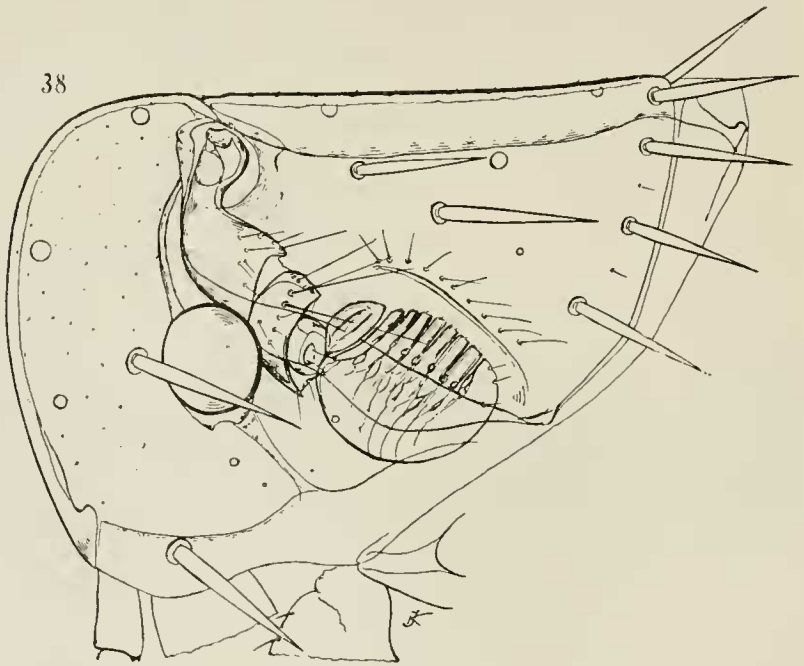
Benguela, on *Procavia bocagei*.——Besides the original 4 ♂♂, 1 ♀ received from Messrs. O. E. Janson & Sons, no further material has come to hand.

In the Key given in 1926 (*Verh. III. Intern. Entom.-Kongress*, p. 605) there is a penslip: line 9 from above, which refers to *P. divergens*, should read "proboscis reaching well beyond apex of palpus."

### 5. **Procaviopsylla spinifex** sp. nov. (text-fig. 38).

In 1926, *l.c.* p. 604, I gave an amplified diagnosis of *Procaviopsylla* in which I stated that the bristle in front of the eye was small or absent. The present new species refutes that statement, which has to be deleted.

♂♀. Very close to the preceding *P. angolensis*, but differs from that species and all the others of the genus in the bristle in front of the eye being very stout,




as are also the larger kind of bristles on head and thorax. Abdominal tergites II to VI with a row of 8 bristles in *P. angolensis* (on the two sides together) and a row of 10 in *P. spinifex*. On inner surface of hindfemur a lateral row of 5 or 6 bristles in *P. angolensis* and 3 or 4 in *P. spinifex*. Mid- and hindtibiae as in *P. angolensis* with 8 dorsal notches. Stigma of segment VIII somewhat broader, particularly in ♀. Processes $P^1$ and $P^2$ of clasper longer than in *P. angolensis*.

Quirimbo, v. 1934, on *Procavia bocagei*, a small series.

### 6. Xenopsylla brasiliensis Baker 1904.

Cf. *antea*, p. 83.

Mt. Moco, iii.1934, on *Rattus rattus*, a series.——Solo R., east of Catengue, iii.1934, in nest of *Otomys*, a series.——The commonest species of *Xenopsylla* in Angola and the Congo. An African species now of wide distribution, accidentally described first from Brazil.

### 7. Xenopsylla versuta Jord. 1925.

*Xenopsylla versuta* Jordan, *Nov. Zool.*, xxxii, p. 100, no. 10, text-fig. 8 (1925) (Benguela).

Benguela, i. 1906 (Ansorge), on *Funisciurus*, a small series of both sexes.—— Occurs also in Tanganyika Territory and Kenya.

The ♂ is easily recognized by the genitalia, the end-tube of the penis-sheath bearing a long tooth directed frontad, the lamina of the penis being apically rounded, not turned up into a point, and sternite IX dorsally membranous (transparent) and gradually curved upwards at the end. The ♀, however, closely resembles that sex of *X. cheopis* and requires close scrutiny; it bears fewer bristles on the side of tergite VIII, the spermatheca is a little smaller, and the duct of the bursa copulatrix less chitinized.

### 8. Xenopsylla cheopis Roths. 1903.

*Pulex cheopis* Rothschild, *Ent. Mo. Mag.* (2), xiv, p. 85, no. 5, pl. i, figs. 3, 9; pl. ii, figs. 12, 19 (1903) (Shendi, Sudan).

Benguela, v.1904, on *Rattus rattus* (Ansorge), 1 ♀.——An Indo-African species now occurring in most warm countries, occasionally in European harbours.

### 9. Rooseveltiella georychi Fox 1914.

*Rooseveltiella georychi* Fox, *Hygienic Labor. Bull.* 97, p. 7, pl. i, figs. 1–6 (1904) (300 miles inland from Benguela).

Cuito Estate and Mt. Moco, iii.1934, on *Cryptomys bocagei* and accidentally on *Rattus rattus*, a small series.

### 10. Ctenocephalides felis strongylus Jord. 1925.

*Ctenocephalus felis strongylus* Jordan, *Nov. Zool.*, xxxii, p. 98, no. 7 (1925) (West, East and South Africa).

Congulu, iv.1934, on *Homo*, 1 ♀.——Bihé, x.1904 (Ansorge), on *Canis adustus*, 1 ♀.——Without a ♂ it is not possible to say whether the ♀♀ belong to *Ct. f. strongylus* or a race of *Ct. connatus*. Cf. *antea*, p. 84.

### Libyastus gen. nov.

The squirrel fleas from tropical Africa described as species of *Ceratophyllus* are all nearly related to each other and form a special group well separated morphologically from the Palaearctic, Oriental and American squirrel fleas. The new genus I propose for their reception is best placed near *Tursopsylla* Wagner 1927.

♀♂. On outer side of forefemur 0–3 lateral bristles, on inner side 0 or 1; hindcoxa on inner side with marginal bristles only. On frons an anterior row of 1–3 bristles and a posterior row of 3. On occiput 1 median bristle not accom-

panied by a small one, the median bristle often reduced or absent, very rarely a bristle near base of antennal groove. Bristles of segment II of antenna all short in ♂, one reaching to middle of club in ♀; club of ♀ exceptionally long, twice as long as broad, not rounded in middle. Hindtibia with 8 dorsal notches. First pair of plantar bristles of tarsal segment V lateral, but distinctly bent ventrad-apicad.

♂. With 1 or 2 antepygidial bristles, the upper one the shorter. Tergite VIII without dorsal spiculose area on inside. Sternite VII reduced to a membrane. Posterior portion of tergite IX nearly completely separated from IX, forming an intercalar sclerite (as in many other fleas). Clasper partially separated from manubrium and dorsal portion of IX; no prominent process P.

♀. With 3 antepygidial bristles. Stylet with 1 lateral bristle. Basa, abdominal sternite, at least on one side, with 1 or more lateral bristles (often present also in ♂). Anal sternite with numerous lateral and ventral bristles none of which are curved and spiniform, 2 each side very long, one apical, the other subapical. Anal tergite each side with one very long bristle, which is longer and thicker than the apical one of stylet. Orifice of spermatheca on a prominent cone, which is curved downward in some species; tail without appendix.——Genotype: *L. infestus* Roths. 1908 (as *Ceratophyllus*).

## KEY TO THE SPECIES

A. Median bristle of occiput much smaller than ventral posterior one. Clasper of ♂ on posterior side with sinus, process P above sinus somewhat curved distad. In ♀ snout of spermatheca not directed downwards.

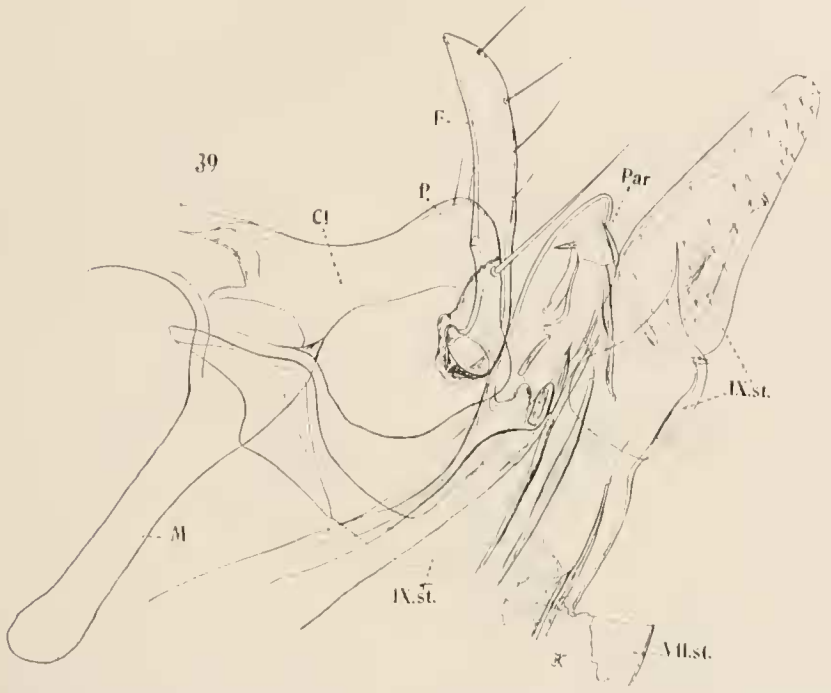
1. *L. infestus* Roths. 1908.——Basal abdominal sternite with numerous lateral bristles. Sclerite F of ♂ broadish, curved frontad at apex, rounded on posterior side. Sternite VII of ♀ with more than 30 bristles on the two sides together. *L. infestus infestus* from Kenya and *L. infestus duratus* Jord. 1931 from Tanganyika Territory.
2. *L. piger* Jord. 1925.——Basal abdominal sternite with few lateral bristles. Sclerite F of ♂ narrow, straight. Sternite VII of ♀ with 14 bristles. Uganda.

B. Median occipital bristle about as thick as posterior ventral one, but usually shorter. Clasper of ♂ without sinus on posterior side. In ♀ snout of spermatheca directed obliquely downwards.

3. *L. consobrinus* Jord. 1925.——Only the ♀ known. Sternite VII with small narrow sinus and about 20 to 22 bristles on the two sides together. Gaboon and Nigeria.
4. *L. stratiotes* Roths. 1905.— Only the ♂ known; possibly the ♂ of the preceding or the following species. Dorsal side of clasper very feebly incurved and distally very slightly convex, with 2 long bristles on posterior side. Spanish Gaboon.
5. *L. notabilis* Jord. 1925.——Only the ♀ known. Sternite VII strongly narrowed, apex obliquely truncate, very feebly incurved, upper angle strongly rounded, projecting farther distad then ventral angle; with 35 bristles. Gaboon.
6. Sp. nov.——♂: dorsal side of clasper incurved and distally rather strongly convex; one acetabular bristle. ♀: sternite VII, distally much broader than in *L. notabilis*, truncate, with 25 or fewer bristles. Angola.

11. **Libyastus vates** sp. nov. (text-figs. 39, 40).

♂♀. Frons with a row of 3 long bristles some distance from eye, middle one smaller than the others, farther forward 2 to 4 much smaller bristles and farther up another bristle close to antennal groove. On occiput a long strong bristle above middle of antennal groove, and another at posterior ventral angle; besides this latter one, the subapical row contains each side only 3 rather short and slender bristles, the interspace between the long bristle and the nearest short one being large. Eye somewhat larger in ♀ than in ♂, longer than broad, the longer diameter




equalling in ♂ the distance from the upper large eye-bristle. Genal process broad, apex rounded.

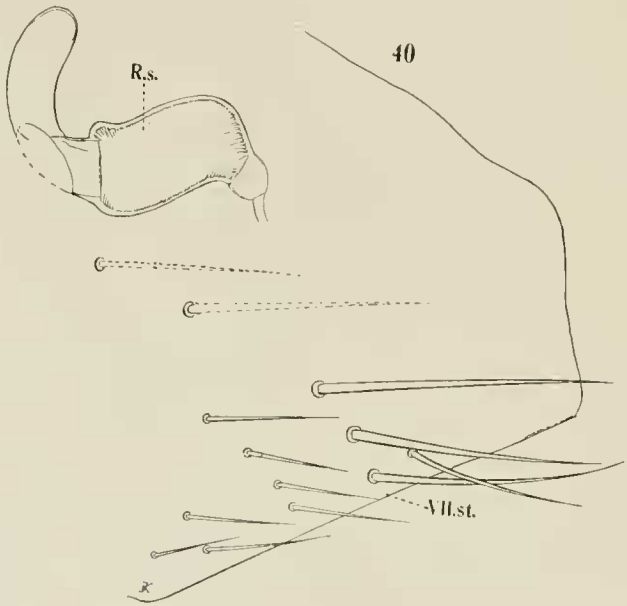
Pronotum dorsally in ♂ as long as comb, in ♀ a trifle longer; a row of 12 bristles and a comb of 20 spines. On mesonotum a row of 10 or 11 bristles, in front of this row another of small bristles, besides some additional dorsal bristles, there being a large bare lateral area. On metanotum the same number of bristles. Mesopleura with 10 bristles in ♂, 7 to 9 in ♀; metepimerum with 6 or 7.

Spines on abdominal tergites: in ♂ I 2, II 4, III 2, IV 2, V 1; in ♀ I 2, II 4, III 2, IV 2, V 0, the 2 on each side of II close together. Bristles on tergites: ♂ III 9, 11, IV 6, 12, VII 6, 8; in ♀ III 11 to 16, 12, IV 12 to 14, 12 or 13, VII 8 or 9, 6 or 7. Bristles on sternites: in ♂ III 3, 6, IV 2, 6, V 3, 6, VI 2, 6, VII 7, 5; in ♀ III 5 or 6, 6, IV 4, 6 or 7, V 5, 8 or 9, VI 9 to 11, 8. On basal abdominal sterite of one ♀ a lateral bristle on one side, none on the other, in second ♀ (Dala Tando) 2 or 3 each side; in ♂ none.

Posteriorly near apex of hindcoxa 2 bristles. Hindfemur with one lateral

bristle on outside and 1 or 2 on inside. On outside of hindtibia a row of 7 or 8 dorso-lateral bristles. Measurements of tarsi: midtarsus, in ♂ 20, 18, 12, 8, 16; in ♀ 21, 19, 13, 8, 16 (Dala Tando specimen) and 23, 19, 13, 9, 17.—— Hindtarsus, in ♂ 54, 32, 20, 11, 17; in ♀ 55, 33, 21, 11, 18 (Dala Tando) and 58, 34, 22, 12, 19. Longest bristle of hindtarsal segment II reaching to two-thirds of III.

Modified Segments.—♂: VIII t. large as in the other species of the genus, with 6 lateral bristles, of which 1 is subventral, and 5 long and 8 smaller marginal and submarginal ones; apical margin angulate and projecting below last bristle. Clasper (text-fig. 39 Cl.) dorsally evenly incurved and then strongly convex, this




portion corresponding to process P of other fleas; ventrally the clasper somewhat unevenly convex; one acetabular bristle, placed above middle. Manubrium M somewhat shorter than in *L. stratiotes*, apically distinctly rounded-widened. Sclerite F long and narrow, of nearly even width, but apically gradually narrowing to an obtuse point, upper half feebly concave on frontal side and convex on posterior side, 4 bristles at posterior margin. Apex of vertical arm of IX st. on frontal side with a round projection which is on a level with lower margin of manubrium M, posterior side also convex at the same level, apical nose long and narrow. Apical lobe of ventral arm of IX st. long, conical, with the tip rounded. Ventral sclerite of paramere, covered by the apical lobe of IX. st., rounded dorsally, its ventral apical angle pointed and produced downward.

♀. VII st. truncate (text-fig. 40), nearly as in *L. notabilis*, but the apex broader and the rounded upper angle not projecting beyond the ventral angle; with 20 to 25 bristles, in *L. notabilis* more than 30. On VIII t., from stigma down, 9 bristles in Dala Tando ♀ and 16 in the other, on inner surface 2 in the former and 4 in the latter. Bristles of anal sternite much more numerous than in *L. notabilis*, more than 30 each side, some of the ventral ones thicker in the

Congulu specimen then in the one from Dala Tando. Stylet 2½ times as long as broad, that of *L. notabilis* being one-third longer than in the new species. Spermatheca as in *L. notabilis*.

Length (specimens somewhat extended): ♂ 3·1 mm., ♀ 3·3 mm.; hindfemur: ♂ 0·53 mm., ♀ 0·56 mm.

Congulu, Amboim district, on *Funisciurus congicus congicus*, v.1934, one pair.——Dala Tando, ix.1908 (Ansorge), on *Funisciurus*, 1 ♀.

The two specimens from Congulu were found on the same individual of the host.

### 12. **Stivalius afer** Roths. 1908.

*Pygiopsylla afer* Rothschild, *Proc. Zool. Soc. Lond.*, p. 618, no. 1, pl. 29, figs. 7, 8 (1908) (Benguela).

Benguela, 200 miles inland (Dr. F. C. Wellman), 1 ♀, no host mentioned.—— Dala Tando, xii.1901 (Ansorge), on *Arvicanthis rufinus*, 2 pairs.

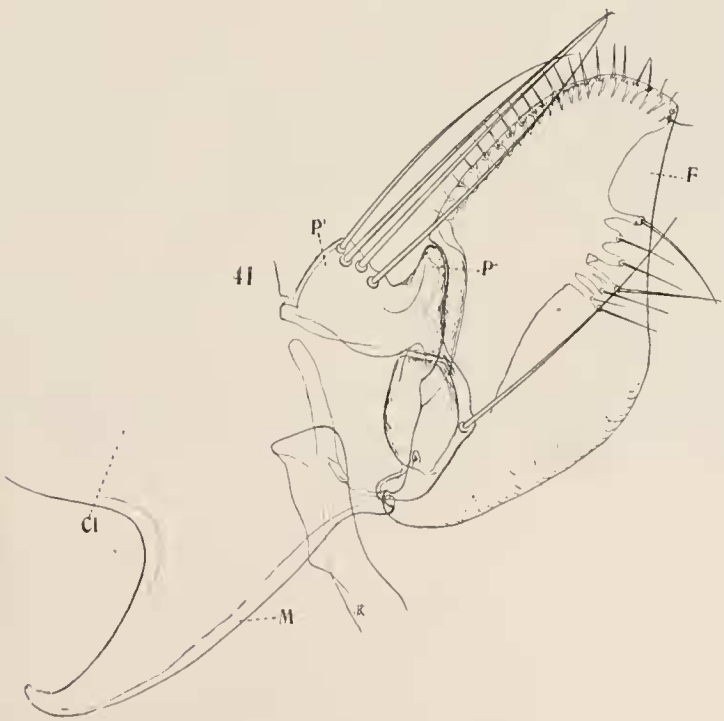
No further Angolan material has come to hand.

### 13. **Ctenophthalmus ansorgei ansorgei** Roths. 1907 (text-fig. 41).

*Ctenophthalmus ansorgei* Rothschild, *Nov. Zool.*, xiv, p. 330, no. 2, text-fig. 4 (1907) (Bihé).

Bihé (= Silva Porto), on *Cryptomys bocagei*, xi. 1904 (Ansorge), 1 ♂, 4 ♀♀.—— Also Dilolo, Congo Belge (Dr. Richard).

Although the ♂ has several times been mentioned in comparison with other




species and with *Ct. a. catanganus* Jord. 1936, the genital armature has not yet been figured. We give here a sketch of the clasper and its appendages.

### 14. **Ctenophthalmus atomus** J. & R. 1913.

*Ctenophthalmus atomus* Jordan & Rothschild, *Nov. Zool.*, xx, p. 551, no. 25, text-fig. 22 (1913) (Ndala Tando); Jord., ibid. xxxviii, p. 295, text-fig. 53 (1936) (Congo Belge).

Dala Tando (= Ndala Tando), on *Arvicanthis rufinus*, xii. 1908 (Ansorge), 1 ♀.——No further specimens from Angola have come to hand; but Dr. Richard collected 2 ♂♂, 1 ♀ off *Pelomys frater* at Dilolo, Congo Belge, close to the Angolan frontier.

### 15. **Dinopsyllus horridus** J. & R. 1913.

*Dinopsyllus horridus* Jordan & Rothschild, *Nov. Zool.*, xx, p. 576, no. 39, text-fig. 41 (1913) (Pedreira).

Pedreira, Bihé, on *Pelomys campanae*, xi. 1904 (Ansorge), 4 ♂♂, 1 ♀.——We have received no other Angolan specimens.

### 16. **Dinopsyllus lypusus** J. & R. 1913.

*Dinopsyllus lypusus* Jordan & Rothschild, l.c., p. 570, no. 34, text-figs. 36, 37 (1913) (Kenya and Uganda).

Mt. Moco, Luimbale, iii. 1934, on *Myomys colonus angolensis*, 1 ♀.

I obtained only this single ♀. It is a small specimen, length (somewhat extended in mounting) 2·4 mm., hindfemur 0·48 mm.; on abdominal tergites II to V altogether 15 marginal teeth. There is a possibility that the specimen is a ♀ of *D. apistus* J. & R. 1913. *L. lypusus* is common in East Africa and extends northward to Darfur; it appears also to be abundant in the Katanga district of the Congo Belge.

The distinctness of *D. lypusus* from *D. ellobius* Roths. 1904 is open to doubt. Extreme specimens are easily distinguished by the difference in the length of the pronotum, in *D. ellobius* the pronotum being but little longer from the comb forward than the dorsal spines of the comb, whereas in *D. lypusus* the pronotum is twice the length of the comb or nearly; in the ♂ of *D. ellobius*, the frons is shorter and the last two long ventral bristles of VIII st. are close together. However, many South African specimens take an intermediate position.

### 17. **Lagaropsylla incerta** Roths. 1900.

*Ceratopsylla incerta* Rothschild, *Entom. Rec.*, xii, p. 37, pl. 2, figs. 2, 5, 6 (1900) (Madagascar and Sierra Leone).

Congulu, on *Chaerephon limbatum*, iv. 34, a long series.——The bat was very plentiful under the roof of the house in which we had our quarters; we caught them with a butterfly-net, and almost every specimen had some fleas. I found nothing on the specimens of this bat and the others brought in by the natives.